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January 30, 2018

City of Camas
616 Northeast 4th Avenue
Camas, Washington 98607
Attention: Robert Maul, Planning Manager

Phone: 360-817-1568
E-mail: rmaul@cityofcamas.us

**Subject: Geotechnical Peer Review
Proposed Green Mountain Subdivision – Phase 3
East of Northeast Ingle Road and Northeast 43rd Circle
Camas, Clark County, Washington
EEI Report No. 17-237-1**

Dear Mr. Maul:

Per your request, **Earth Engineers, Inc. (EEI)** has completed a geotechnical review of the project referenced above.

PROJECT BACKGROUND INFORMATION

Our understanding of the project is based on the following information that has been provided to us.

- **September 28, 2017 report by Columbia West Engineering, Inc. (CWE) titled “Geotechnical Critical Areas Report, Green Mountain North, Camas, Washington.”** The report was performed for Green Mountain Land, LLC of Lake Oswego, Oregon.
- **January 12, 2018 report by CWE titled “Geotechnical Setback Summary Discussion, Green Mountain North – Phase 3, Camas, Washington, CWE W.O. No. 17012A.”** This report was performed for Green Mountain Land, LLC and was intended to supplement their September 28, 2017 geotechnical report.
- **September 2017 drawing by Olson Engineering Inc. titled “Green Mountain Phase 3, Sections 17 T. 2 N., R. 3 E., W.M. City of Camas, WA,” Sheet 1 of 1.** This drawing is an existing conditions topographic survey.

- **Set of 8 drawings by Olson Engineering Inc. titled “Green Mountain Phase 3 (Part of Green Mountain PRD #SUB14-02),” Sheets P1.0, P1.2, P1.3, LS1.0, LS1.2, LS1.3, LS1.4, and T1.0, all dated October, 2017.** These drawings show the proposed subdivision layout.
- **Undated drawing by Olson Engineering Inc. titled “Green Mountain Phase 3 Tree Preservation Exhibit.”** This exhibit appears to show that all trees within the proposed lots, streets, and stormwater pond will be removed, while all trees outside of these development areas will not be disturbed.
- **Set of 5 drawings by Olson Engineering Inc. titled “Green Mountain Mixed Use P.R.D. Phase 3” Sheets 1 through 5, all dated October 2017.** These drawings include preliminary utility plans, preliminary stormwater facility plans, and preliminary grading plans.

Briefly, we understand that the project will include the the development of 159 single family lots, streets, a stormwater pond, and open space areas on the approximate 115-acre property. The drawings indicate the Phase 3 project will be developed in 6 sub-phases (Phase 3A through 3F). The property is located on the west and southwest flank of Green Mountain and the topography ranges from nearly level to very steeply sloping.

PURPOSE AND SCOPE OF SERVICES

The purpose of our geotechnical review was to assess the documents provided to us and provide a professional opinion on whether the geotechnical reports by CWE meet the geotechnical standard of care and Camas Municipal Code (CMC) Chapter 16.59—Geologically Hazardous Areas. Part of our review was to consider the proposed residential lots located within a geotechnical setback line established by CWE. These lots are located within or adjacent to steep slopes. We understand the City is concerned that the project proposal shows some of the building pads being located within the hazard areas (i.e. the geotechnical setback line).

VISUAL SITE RECONNAISSANCE

As part of our project review, EEl Principal Geotechnical Engineer Troy Hull spent approximately 90 minutes walking the property on January 8, 2018 to familiarize himself with the local topography.

REPORT REVIEW COMMENTS

1. CWE performed a detailed subsurface site investigation and literature review. They identified the geologic hazards that are present on this property: soil erosion, potentially

unstable, steep soil slopes, and rockfall. And they provided mitigation recommendations for these hazards that include:

- Implementing a geotechnical setback line of 35 feet (measured horizontally) from the top of the slope break in the area between the central bench and valley floor. The setback line is shown on Sheets P1.0, P1.2, P1.3, 1 of 5, and 2 of 5 by Olson Engineering and affects proposed lots 41-44, 50-52, 66-81, and 159 (24 total lots). Of these lots, the geotechnical setback line encroaches on the following building pads: 41-44, 50-52, 70-81, and 159 (20 total lots). *Note: The geotechnical setback line is not intended by CWE to be a do-not-disturb area; small disturbances such as minor landscaping or fence building are acceptable from a geotechnical standpoint.*
 - Some encroachment of residential foundations proposed within the geotechnical setback line may be allowed if evaluated on a case-by-case basis by the Geotechnical Engineer.
 - Placement of engineered structural fill or stockpiles of soil is prohibited within the geotechnical setback line.
 - Soil excavation may be acceptable within the geotechnical setback line and requires review by CWE.
 - Vegetation removal within the geotechnical setback line should be minimized.
 - No significant removal of material near the toe of slopes shall be allowed.
 - Erosion hazard should be mitigated by developing an erosion control plan. The plan should include prohibiting concentrated drainage or water flow over the face of slopes and minimizing vegetation disturbance.
2. We noted that CWE performed slope stability calculations to determine the geotechnical setback line. CWE included in the report text the estimated soil and rock parameters used in their slope stability calculations. The parameters appear to be reasonable. However, CWE did not include the actual output from their slope stability calculations (i.e. the slope cross-sections with failures planes shown) in either of their reports so we are not able to comment at this time whether the 35 foot setback is appropriate or not. **We recommend CWE submit their slope stability calculations for review.**
3. We understand that the City is currently in the land use approval stage of the project, and the City must determine whether all of the proposed lots are buildable. That is not entirely clear after reading the CWE reports. The sole concern is where CWE's recommended 35-foot geotechnical setback line is located within 20 of the building pads. If the criteria for land use approval is that the applicant must demonstrate that the proposed lots are buildable, then they have not met that threshold. CWE states in their January 12, 2018 report, "...encroachment of residential structures and other site improvements may be feasible if evaluated on a case-by-case basis." Because CWE's

recommendation includes 'may', it is our opinion that the building pads located within the the geotechnical setback line have not yet been demonstrated to be buildable. **As a condition of approval, we recommend that CWE perform additional geotechnical explorations within some of the subject lots so that they can confirm the lots truly are buildable. To be clear, we are not recommending that each and every of the 20 affected lots be further explored with borings or test pits. CWE already performed 6 explorations in the area of these lots and they should determine how many more explorations are required to sufficiently supplement the existing data.**

4. CWE notes in their September 28, 2017 report that they should be retained to perform a drawing review of the grading and erosion control plans. **As a condition of approval, we recommend that CWE complete a geotechnical review of all the project drawings, including the grading and erosion control plans.**
5. The Tree Preservation Exhibit drawing by Olson Engineering (which we do not believe has been provided to CWE because they didn't mention it in either of their reports) appears to indicate that all trees within the proposed residential lots will be cleared. CWE had recommended that vegetation clearing within the geotechnical setback line be minimized. By locating some of the proposed lots within the geotechnical setback line and then clearing all trees on those lots, it's not clear that the applicant has met the recommendation to minimize vegetation disturbance. **We recommend as a condition of approval, that CWE be provided the Tree Preservation Exhibit and then provide a professional recommendation as to whether the planned vegetation removal is acceptable or not from a geotechnical standpoint.**

We do have some concern about the amount of trees that are planned to be cleared on the steep slopes. Typically, vegetation would be left relatively undisturbed in order to address soil slope stability. However, if it is found that the steep slopes consist of stable bedrock instead of soil, then we anticipate that tree removal would not have an adverse effect on the rock slope stability. As such, CWE might consider evaluating whether the slopes are bedrock or soil. This might be as simple as traversing the steep slopes with a hand-held probe rod or using the drive probe test to confirm depth to bedrock.

6. We understand the City has some concern over whether the steep slope areas indicated with the geotechnical setback line should be allowed to intrude on the residential lots or be grouped into an undeveloped tract, or tracks, owned by the subdivision's HOA. It is our experience that jurisdictions have handled it both ways in the past. Some jurisdictions have allowed what we would term to be 'geologic hazard areas' to be located on the developed residential lots and some have required that the geologic hazard areas be located on tracts which will not be developed. From a geotechnical standpoint, either is acceptable. In our experience, the primary reason for allowing the inclusion of hazard areas on the residential lots would be so that the City is dealing with a homeowner, and not an HOA, regarding any future development violations (i.e. prohibited ground disturbance within the geologic hazard area). It is our experience that HOA's can sometimes be difficult to coordinate with compared to the individual property owners.

The primary reasons for placing the geologic hazard area on the undevelopable track is that then it is clear to the adjacent property owner that the tract is not their property and there is no confusion as to whether they are permitted to do any ground disturbance within the hazard area (i.e. they would be trespassing).

LIMITATIONS

This report has been prepared for the exclusive use of the City of Camas for the specific application to the proposed Green Mountain Subdivision – Phase 3, in Camas, Washington. EEL does not authorize the use of the advice herein nor the reliance upon the report by third parties without prior written authorization by EEL.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

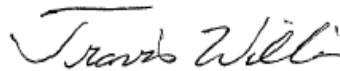
We appreciate the opportunity to perform this geotechnical engineering evaluation. If you have any questions pertaining to this report, or if we may be of further service, please contact Troy Hull at 360-567-1806 (office) or 360-903-2784 (cell).

Sincerely,
Earth Engineers, Inc.



Troy Hull, P.E.
Principal Geotechnical Engineer

Reviewed by:



Travis Willis, P.E.
Principal Geotechnical Engineer